NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

GRASSED WATERWAY

(Acre)

CODE 412

DEFINITION

A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- to convey runoff from terraces, diversions, or other water concentrations without causing erosion or flooding
- to reduce gully erosion
- to protect/improve water quality.

CONDITIONS WHERE PRACTICE APPLIES

In areas where added water conveyance capacity and vegetative protection are needed to control erosion resulting from concentrated runoff and where such control can be achieved by using this practice alone or combined with other conservation practices. This practice shall only be used where an adequate stand of perennial vegetation can be established and maintained.

CRITERIA

Criteria Applicable to All Purposes

General. Grassed waterways shall be planned, designed, and constructed to comply with all Federal, State, and local laws and regulations.

The waterway shall meet both the minimum capacity requirements with maximum expected vegetative retardance and not exceed the maximum velocity requirements with minimum expected vegetative retardance.

Capacity. The minimum capacity shall be that required to convey the peak runoff expected from a storm of 10-year frequency, 24-hour duration. When the waterway slope is less than 1 percent, out-of-bank flow may be permitted if such flow will not cause excessive erosion. The minimum in such cases shall be the capacity required to remove the water before crops are damaged. NRCS Conservation Practice Standard "Surface Drainage" Code 608, and Chapter 14, "Drainage", of the Engineering Field Handbook (EFH) Part 650 may be used to determine design capacity, plus an appropriate safety factor, when the waterway slope is less then 1 percent.

Design. Guidance on the design of a grass waterway can be found in the EFH, Chapter 7, "Grass Waterways and Outlets". When designing a grass waterway on slopes of less then 1 percent, the designer will assure himself or herself that all Criteria of this Standard are met.

Velocity. Design velocities shall not exceed those obtained by using the procedures; Manning's "n" values from the "n-VR" relationship and recommendations in the EFH Chapter 7, "Grassed Waterways and Outlets", or Agricultural Research Service (ARS) Agricultural Handbook 667, "Stability Design of Grass-Lined Open Channels".

Design velocity (V_1) in grass waterways shall not exceed 5.0 ft/sec. Good vegetative cover, mulch netting, temporary gully barriers, such as hay bales, and proper maintenance will be needed to establish and maintain waterways having velocities approaching 5.0 ft/sec

Where site conditions and velocities warrant the use of a structural lining, the design shall be in accordance with NRCS Conservation Practice Standard "Lined Waterway or Outlet" Code 468.

Shape. Grass waterways shall be constructed either parabolic, trapezoidal or "V" shaped. They shall be fairly shallow and wide. The ratio of top width to depth will typically be not less than 8:1. To reduce flow meandering and siltation when low flows and velocities are present use parabolic or "V" shaped grass waterways.

Width. The bottom width of trapezoidal waterways shall not exceed 100 feet unless multiple or divided waterways or other means are provided to control meandering of low flows.

Side Slope. Side slopes shall not be steeper than a ratio of four (4) horizontal to one (1) vertical. They shall be designed to accommodate the equipment anticipated to construct and maintain the waterway.

Depth. The minimum depth of a waterway that receives water from terraces, diversions, or other tributary channels shall be that required to keep the design water surface elevation at, or below the design water surface elevation in the tributary channel, at their junction when both are flowing at design depth.

Freeboard above the designed depth shall be provided when flow must be contained to prevent damage. Freeboard shall be provided above the designed depth when the vegetation has the maximum expected retardance.

For waterways with slopes less than 1 percent, the average depth from normal ground shall not exceed 2.5 feet.

Drainage. Designs for sites having prolonged flows, a high water table, or seepage problems shall include NRCS Conservation Practice Standards "Subsurface Drains" Code 606, "Underground Outlets" Code 620, stone center waterways, or other suitable measures to avoid saturated conditions.

Outlets. All grassed waterways shall have a stable outlet with adequate capacity to prevent damage from ponding or flooding. The outlet can be another vegetated channel, an earthen ditch, a grade-stabilization structure, filter strip or other suitable outlet.

Vegetative Establishment. Grassed waterways shall be vegetated according to NRCS Conservation Practice Standard "Critical Area Planting" Code 342.

Seedbed preparation, time of seeding, seeding mixture, seeding rate, stabilizing crop, mulching, or mechanical means of stabilizing, fertilizer, and lime requirements shall be specified for each applicable area. When practical, topsoil shall be stockpiled and spread over the completed waterway to provide a seedbed for vegetation.

Establish vegetation as soon as conditions permit. Use mulch anchoring, nurse crop, straw or hay bale dikes, filter fences, or runoff diversion to protect the vegetation until it is established. When possible, do not allow large flows to enter the waterway until the vegetation is well established.

CONSIDERATIONS

This practice may adversely effect cultural resources and must comply with NRCS General Manual 420, Part 401.

Important wildlife habitat, such as woody cover or wetlands, should be avoided or protected if possible when siting the grassed waterway. If trees and shrubs are incorporated, they should be retained or planted in the periphery of grassed waterways so they do not interfere with hydraulic functions. Mid or tall bunch grasses and perennial forbs may also be planted along waterway margins to improve wildlife habitat. Waterways with these wildlife features are more beneficial when connecting other habitat types; e.g., riparian areas, wooded tracts and wetlands.

Where wildlife is a landowner concern, the waterway width may be increased not to exceed twice the design width, or the 100 feet maximum limitation for trapezoidal shapes.

The most critical time in successfully installing grassed waterways is when vegetation is being established. Supplemental irrigation may be warranted.

Proper planning, design, and layout of grassed waterways is essential to enable erosion control vegetation to be established, used, and maintained. Good vegetation will reduce

surface runoff and increase infiltration and percolation into the ground water. Grassed waterways are essential as outlets for open flow terraces, diversions, contour buffer strips, water and sediment control basins, and contour farming. A well-established waterway can reduce nutrients and pesticides from leaving the land and use plant nutrients that move onto the waterway.

Where vegetation is to be established by seeding, consider limiting the maximum design velocity to not exceed 4 ft/sec on erosion resistant soils and 3 ft/sec on easily eroded soils.

Water-tolerant vegetation may be an alternative on some wet sites.

Provide livestock and vehicular crossings as necessary to prevent damage to the waterway and its vegetation.

Add width of appropriate vegetation to the sides of the waterway for wildlife habitat.

Grass waterway channels should be protected from sediment deposition. If sediment delivery cannot be controlled before it reaches the waterway, consideration should be given to installing vegetative filter strips on the sides of the waterway to intercept the sediment.

Many soils either do not need or are not well suited for a water management system. Reference will be made to soil interpretations in Section II of the Field Office Technical Guide to determine those features that affect the construction function or might cause problems after construction. Some fields are not well suited to a system because they are too sandy, the topsoil is to shallow, or the slope is too steep or too flat. Good judgment should be used in evaluating the suitability for a water management system on fields with these soil features. Terraces, diversions, grassed waterways, or disposal areas should be installed only where field conditions facilitate stable systems.

PLANS AND SPECIFICATIONS

Plans and specifications for grassed waterways shall be in keeping with this standard and shall describe the requirements for applying the practice to achieve its intended purpose(s).

A vegetative plan or written recommendations for treating with vegetation will be made for each waterway or group of waterways. Vegetative treatment shall be applied as shown in specifications or plans. Vegetation includes seedbed preparation, liming, fertilizing, seeding, and either natural mulch or manufactured mulches when needed.

Any necessary job sheets, drawings, plans, or narrative statements shall be included in the plans and specifications.

Development of plans will be guided by NRCS Engineering Field Handbook, Chapter 5, and shall be in accordance with NRCS National Engineering Manual, Parts 541 and 542.

OPERATION AND MAINTENANCE

An operation and maintenance plan shall be provided to, and reviewed with, the landowner. The plan shall include the following items and others as appropriate.

A maintenance program shall be established to maintain waterway capacity, vegetative cover, and outlet stability. Vegetation damaged by machinery, herbicides, or erosion must be repaired promptly.

Seeding shall be protected from concentrated flow and grazing until vegetation is established.

Minimize damage to vegetation by excluding livestock whenever possible, especially during wet periods.

Inspect grassed waterways regularly, especially following heavy rains. Damaged areas will be filled, compacted, and seeded immediately. Remove sediment deposits to maintain capacity of grassed waterway.

Landowners should be advised to avoid areas where forbs have been established when applying herbicides. Avoid using waterways as turn-rows during tillage and cultivation operations. Prescribed burning and mowing may be appropriate to enhance wildlife values, but must be conducted to avoid peak nesting seasons and reduced winter cover. The primary nesting season for most ground nesting birds in Louisiana is from April 15 to July 15.

Mow or periodically graze vegetation to maintain capacity and reduce sediment deposition. Control noxious weeds.

Do not use as a field road or turn row. Avoid crossing with heavy equipment when wet.

REFERENCES

NRCS General Manual 420, Part 401

NRCS National Engineering Manual, Parts 541 and 542

NRCS National Engineering Field Handbook, Part 650, Chapter 5